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METERING SYSTEM FOR WASHING SUBSTANCES

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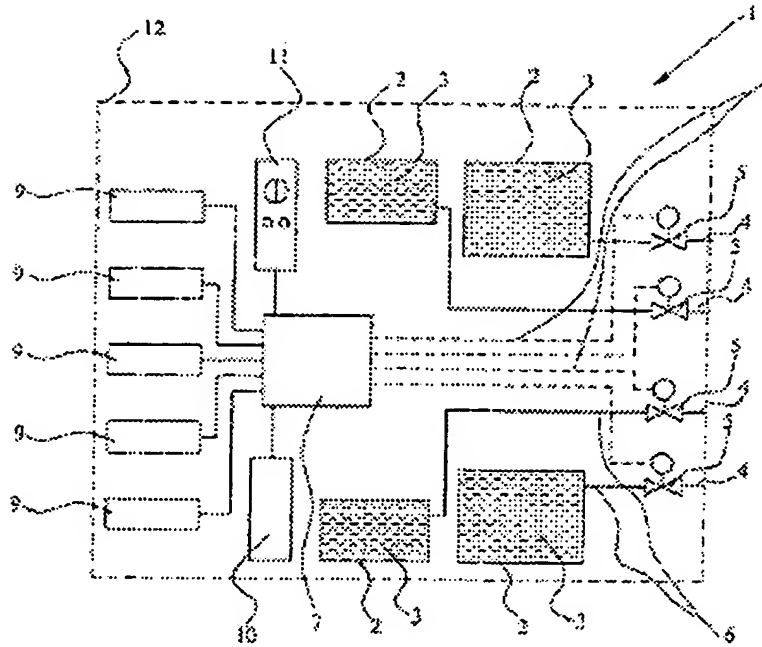
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[Abstract]

A metering system 1, in particular, for washing substances, preferably to be held in the washing space of a washing machine, and a method for washing clothes in a washing machine are described.



[0001]

The invention under consideration concerns a metering system, in accordance with the preamble of Claim 1, in particular, for washing substances, preferably to be held in the washing space of a washing machine, and a method according to the preamble of Claim 28.

[0002]

Detergents and cleaning agents for washing machines and dishwashers are currently offered to the end customers, for the most part, as so-called universal detergents with all required functionalities. By the combination of water softeners, basifiers, surfactants, enzymes, and bleaching agents, it is possible in this way to remove the usual stains on textiles. The ratio of the individual components corresponds thereby to a previously established norm. In general use, individual substances are metered in too low a dose or in an excess dose. For special uses, such as special washing machines in the commercial sector, individual components are already separately metered--thus, for example, fresh water is softened with ion exchangers, and correspondingly less universal detergent must be used. The water softening can be simply determined and controlled via the determination of the electrical conductivity of the softened water.

[0003]

Developments to also equip washing machines in the end customer sector with these devices were already carried out with the pertinent appliance manufacturers--however, it has not been

possible for the corresponding appliances to gain acceptance on the market up to now. There are various reasons for this. Due to the more expensive technology, the price for the appliance is increased; the appliance manufacturer must bind himself to a detergent producer via the selection of the components to be metered, and the market penetration takes place only very slowly, because only a fraction of the bought washing machines are equipped with such a system.

[0004]

From the state of the art, a metering system with a holding space and outlet openings for holding the detergent in the washing drum of a washing machine is known. This metering system releases, in an uncontrolled manner over the entire washing process, the entire quantity of previously poured-in detergent, independent of the degree of soiling and the quantity of clothes. The disadvantage of this system is, in particular, that the release of the detergent is permanent--that is, uncontrolled--and thus does not run in an optimized manner and that an excessively high consumption of detergent takes place. Moreover, such a metering system does not make possible a purposeful metering of the detergent at different times and, in particular, metering of different substances for the different phases of the washing process. Such metering systems are thus suitable only for making available traditional detergents or softeners.

[0005]

Consequently, it is the goal of the invention under consideration to indicate an improved metering system for washing substances and an improved method for the washing which make possible a minimizing of the detergent consumption with optimal washing results, wherein, in particular, an adaptation of the detergent or the detergent composition, preferably according to the type and quantity, to the individual requirements is possible.

[0006]

The above goal is attained, in accordance with the proposal, by a metering system in accordance with Claim 1 or a method according to Claim 28. Advantageous refinements are the object of the subclaims.

[0007]

A basic idea of the invention under consideration consists in making available a metering system to be held in the washing space of a washing machine, in which the release of the washing substance or several washing substances during the washing process can be controlled.

[0008]

The term "washing machine" is understood to mean, in accordance with the invention, not only a washing machine for clothes, but rather this term is also meant, in accordance with the invention, to refer to washing apparatuses of all types, for example, washing apparatuses for the cleaning of dishes, in particular, dishwashers, or in general, systems for the cleaning of objects, for example, cleaning baths.

[0009]

The term "washing substance" is understood, in accordance with the invention, to mean detergent and/or cleaning action substances and their mixtures. Examples of washing substances in accordance with the invention are, in particular, detergent and/or cleaning action enzymes and enzymatic systems (in particular, amylases, cellulases, lipases, and proteases), enzyme preparations--that is, enzyme-rich formulations, with whose aid the enzymes can be made process-capable, self-repellent and soil-release active substances, bleaching agents (for example, based on hypochlorite or peroxide), detergent and/or cleaning action inorganic and organic acids, antimicrobial active substances, graying and decolorization inhibitors, active substances for color protection, substances and additives for washing treatment, surfactants of all types (for example, surfactants with softener characteristics, ionic and nonionic surfactants, etc.), pH adjusters, in particular, alkalis and pH buffer substances.

[0010]

In a normal universal detergent of the state of the art, different enzymes (for example, proteases, amylases, cellulases, lipases, etc.) are used for different stains. The problem thereby exists that the enzymes are either inhibited or destroyed by other components in the detergent or influence each other negatively, in particular, because they are used simultaneously. In particular, the percarbonate contained as a bleaching agent acts negatively on washing performance on enzymatic stains.

[0011]

In an independent metering system of the type in accordance with the invention, on the other hand, the individual components can be separated from one another, and the previously described effect is omitted. Since, for example, proteases can degrade the other enzymes, the enzymes in conventional universal detergents are distributed, for example, in low concentration in granular carrier materials, and in this way, the enzymes are protected by dilution. The separation of the individual enzymes in a metering system in accordance with the invention, in particular, in various metering chambers, offers the great advantage that the negative influence of the enzymes among one

another is ruled out, and moreover, there is the possibility of, for example, using the enzymes in a time-staggered manner (for example, proteases time-delayed after the effect of the other enzymes, so that they [the other enzymes] are not damaged by the proteases) and in this way further increasing their washing performance.

[0012]

In accordance with DE 43 12 010 A1, enzymes offer the great advantage that the total volume of the detergent used can be clearly reduced. Whereas with a universal detergent, up to 150 g detergent substances (surfactants, builders, alkalis, bleaches, enzymes and perfume) are used, already a quantity of less than 2 g enzymes--dependent on their activity and on the concentration of the formulation in which they are present--can be sufficient in the case of the metering system in accordance with the invention.

[0013]

As an expansion to the previous spectrum of enzymes in universal detergents, it is possible to also use, for example, enzymes such as peroxidases in a metering system in accordance with the invention which release per acids from suitable substrates which have a bleaching effect comparable with that from conventional percarbonates.

[0014]

So that the enzymes can be absorbed on the stains which they are to degrade, small quantities of surfactants can be used as wetting agents. Since this process is in the foreground and the dirt detachment is not required because of the higher enzyme concentration, a small quantity of nonionic surfactants is generally sufficient. In this way, for example, the otherwise required water softening can be omitted.

[0015]

As explained before, the release of the washing substance during the washing process is controlled with the metering system in accordance with the invention. One can also consider thereby the release of several washing substances, in particular, independent of one another and/or controlled over time.

[0016]

In general, the release of the washing substance 3 takes place as a function of at least one parameter or the change of such a parameter. The term "parameter" is understood to mean, in accordance with the invention, in particular, physical or chemical parameters which describe, in

particular, the status or the state of the washing process--thus, for example, the quantity of water, the water filling, the water wetting, the entry and/or exit of water into or out of the metering system, its holding space or the washing space surrounding the metering system during use, the time period (for example, release of the washing substance over a specific period), the time, in particular, with reference to the washing process (for example, the release of the washing substance after a specific washing time), the temperature, the pH value, the water hardness, the ion concentration, or the substance concentration, and the like.

[0017]

Specific physical, chemical, and/or biochemical sensors make possible, for example, the monitoring of concentrations of individual substances or the running of processes. A simple example is the control of water softening via the electrical conductivity. More specific uses are, for example, the determination (of concentrations) of surfactants, enzymes and per acids as detergent substances or the direct determination of water hardness via chemical sensors. With these sensors, there is now the possibility of controlling the metering of the desired components so that a desired activity can be determined or attained in the washing liquor. The consumption of detergent substances can, in particular, be determined by their removal in the washing liquor, and a subsequent metering can take place in line with the need. In this way, for example, the quantity of the clothes and the type and extent of the soiling can be determined indirectly, and the metering of the individual components can be controlled without the further intervention of the user.

[0018]

The invention under consideration makes it possible for an autonomously operating system to meter the required substances in a washing process according to the need.

[0019]

Additional advantages, characteristics, aspects, and features of the invention under consideration can be deduced from the following description of a preferred embodiment example, shown in the drawing. The invention under consideration is in no way restricted to this, however.

[0020]

The single figure shows a schematic representation of a metering system in accordance with the invention.

[0021]

The metering system 1 is particularly suitable for the reception in the washing space of a washing machine, for example, into the washing drum of a washing machine for clothes or into the washing space of a dishwasher or, in general, into the container of an apparatus intended for cleaning purposes.

[0022]

The metering system 1 has at least one holding space 2 for at least one washing substance 3 and at least one correlated outlet 4 for the release of the at least one washing substance 3 during the washing process.

[0023]

In the depicted embodiment, the metering system 1 in accordance with the invention can have several holding spaces 2 for the washing substance 3 and several correlated outlets 4, wherein the holding spaces 2 can have different sizes.

[0024]

Moreover, the metering system 1 has at least one control element 5 so that the release of the washing substance 3 during the washing process can be controlled. The control element 5 can be an osmotically operating pump, a valve, an adjustable throttle, another conveyance device, or the like.

[0025]

If several holding spaces 2 are present for several washing substances 3, the release of all washing substances 3 can be controlled, especially, independent of one another.

[0026]

The control element 5 can be correlated with the holding space 2, the outlet 4, and/or a conduit 6 connecting the holding space 2 with the outlet 4. In particular, the outlet 4 and/or the conduit 6 can be blocked, if needed, by the control element 5.

[0027]

In accordance with a special embodiment of the invention under consideration, the release of the washing substance 3 can be interrupted in a controlled manner.

[0028]

Moreover, the metering system 1 in accordance with the invention has a control device 7. In particular, the control device 7 has a microprocessor or is formed by a microprocessor. The control device 7 controls the control element 5.

[0029]

The control element 5 can be controlled, in particular, electrically, by the control device 7 and can be connected to the control device 7 by means of at least one electrical connection conduit 8.

[0030]

Moreover, provision can be made so that the control device 7 has a time basis, for example, a clock or a timer.

[0031]

Preferably, control functions of the control device 7 can be programmed and in particular, can be carried out by a control program. For example, a closing or opening when certain limiting values of the parameter are exceeded or fall short or there is a specific quantity release that can take place.

[0032]

Moreover, the metering system 1 in accordance with the invention has at least one sensor 9 for the recording of at least one parameter. The sensor 9 can, for example, record the quantity of water, the water filling and/or wetting, the entry and/or exit of water, the time duration and/or the time period, in particular, with reference to the washing process, the temperature, the pH value, the water hardness, and/or the ion and/or substance concentration and/or their changes.

[0033]

In particular, at least one switching function can be triggered by means of the sensor 9--perhaps in connection with the control device 7--in particular, the switching on and/or switching off of the metering system and/or the selection of a control program, for example, as a function of the wetting by water, the presence of water, its temperature and/or a (longer-lasting) movement of the metering system (in the washing drum).

[0034]

Furthermore, the metering system 1 has an energy supply device 10, in particular, a voltage source (for example, a battery or a storage cell).

[0035]

In this manner, the system 1 in accordance with the invention makes possible, in particular, the determination of the activity of the components with sensors and a storage of the required detergent substances and their metering.

[0036]

With regard to the volume of the system 1 in accordance with the invention, the following can be said: the metering of the substances 3 according to need requires, in particular after an activation of the system 1, for example, a determination of the concentration of the substances 1 with suitable sensors and the metering resulting from these data. The system 1 should work independently--that is, it should, for example, be introduced as a metering dispenser together with the clothes into the detergent drum. For such a use, it should not substantially exceed (for example, 8-15 cm in diameter) the size of a traditional metering sphere of a detergent. Since in this way only a limited volume is available and such a metering dispenser should contain the required detergent substances for a number of washing operations, for example, at least 25 washings, the traditional detergent substances as they are used in universal detergents should not be used in such a metering dispenser according to a special embodiment of the invention under consideration. This problem can be circumvented, for example, in that in particular, enzymes are used as detergent substances. Universal detergents with an increased concentration of enzymes and thus a reduced volume have already been described in the state of the art. The possibilities for such enzymatic detergents can be found in the corresponding literature of the state of the art.

[0037]

The sensors 9 can be used in the system 1 in accordance with the invention for various purposes. It should preferably be possible to start the system 1 via a simple switch--however, it should also be prevented, in particular, that with an unintended start the system 1 reacts incorrectly and the contained substances are released. A simple solution for this goal is, for example, a moisture sensor, which ensures that the metering is active only if the metering system 1 is sufficiently wetted with water. Another possibility for ensuring a proper situation is, for example, a temperature sensor. The start of the washing process can, in particular, be determined in that the supplied fresh water has a lower temperature and the beginning of a washing process can be detected via the rapid temperature decline during the supplying process. Another possibility is offered, for example, by a

motion sensor also, which, for example, detects the motion of the metering system 1 in the washing drum. In this way, the metering system 1 can distinguish, for example, between a simple, unwanted flooding and a washing process.

[0038]

More important than the previously described sensor to secure and/or control the functionality of the system are the sensors for the determination of the activity of the detergent substances. If one uses, for example, enzymes as detergent substances, sensors in particular can be used which can determine the activity of enzymes. As soon as the sensors detect a previously stipulated concentration of enzymes in the washing liquor, the metering process is stopped. In case of a faulty function of the chemical sensors, the independent metering system 1 can still be operated in a limited function in that, for example, a "standard quantity" of detergent substances is added. The bleaching effect which is attained with the peroxidases can, for example, be determined directly with biochemical sensors so that for this process either the activity of the corresponding enzyme can be determined directly or the concentration of the per acid can be determined indirectly.

[0039]

The metering technology must fulfill a few basic requirements. A sufficient mechanical stability should be guaranteed as the most important criterion so that the metering system 1 survives an impact or a fall or a spinning process in the washing machine undamaged. Since the metering of liquid substances can be carried out in a simpler manner and with a greater accuracy, they are preferably used. For example, enzymes can be stored and used very well as suspensions.

[0040]

In order to design the metering system as simple and fail-safe as possible, control elements, for example, pumping devices, are used in the metering technology. However, it is also possible to proceed, for example, without such pumping devices also: A possible alternative for the individual components are, for example, cartridges which are constructed and prestressed in such a way that they independently empty completely. Corresponding elastic materials make up one possibility which also ensure a greater mechanical safety with impacts or during a spinning process.

[0041]

The entire system 1 can be controlled, for example, via a microcontroller which records and evaluates, in particular, the data from the sensors 9, which determines the metering of the individual components required at the moment and controls the corresponding metering. The device 1 can be started, in particular, via a simple switch. An algorithm in the control, for example, determines the

start of the washing process. For the communication with the user, for example, one or two preferably simple status light indicators, such as light-emitting diodes or the like, which indicate the orderly state of the system and the required replenishing of one or more components are sufficient.

[0042]

The metering system 1 therefore generally consists of components with basically different service lives and different degrees of consumption. Whereas the central control 7 and the metering system 1 have a long service life, the sensors 9 are perhaps subject to a certain ageing and must be replaced after a certain number of washings. The detergent substances 3 finally are an exclusive consumption material, and the maximum number of washings results directly from their consumption and the volume of the metering system 1.

[0043]

In view of this background, a deposit and/or recirculation method, for example, offers itself as a possibility for the metering system 1, wherein, for example, the manufacturer or a service enterprise is in charge of replenishing the detergent substances 3 and checking the state of the sensors 9.

[0044]

To supply or replenish the washing substances 3, replaceable tanks with a holding space 2 or several holding spaces 2 may perhaps be provided, perhaps also with an integrated control element 5.

[0045]

However, other constructive solutions are also possible. For example, washing substances 3 can be simply supplied to the system 1 by the force of gravity--perhaps with an opening of corresponding vent openings, and/or suctioned in by the system, for example, by an internal or external pump or by corresponding compression of the system 1 which can then be compressed if necessary.

[0046]

A concrete example will be given below for a system designed as a metering sphere with a diameter of 12 cm. The metering sphere is, for example, activated by a simple switch and introduced together with delicate articles of clothing into the washing drum, and subsequently, a fine or wool washing program is started. As a result of, for example, the lowering of the temperature, for example, by the fresh water flowing in, the water itself, and/or the motion of the washing drum, the

metering process is started. The system 1 recognizes this beginning of the washing process in this way and ignores the [water] supplying processes recurring cyclically in the further course, since the required activation via the switch does not occur. As soon as a sufficient quantity of water was flushed into the washing drum--it can, for example, be determined by the moisture sensor or the elapsed time--the metering of the detergent substances is started. Since the substances can negatively influence each other under certain circumstances, they are metered in, in particular, in a time-staggered manner--that is, after for example, amylases, cellulases, and lipases have previously removed the corresponding stains, proteases, for example, can be subsequently added. When using enzymes as detergent substances, it is recommendable that surfactants--particularly nonionic surfactants--be correspondingly metered in as wetting agents. Following the cleaning process, for example, peroxidases can be optionally added for the bleaching of the textiles, and after a first spinning process--for example, detected via the mechanical sensor, softeners--and lastly, perfume also can be metered in as needed.

[0047]

Corresponding to this example, it is possible to use the metering system 1 in other applications also. As the most obvious possibility, one can surely mention dishwashers--however, the detergent substances and the operating parameters of the appliance must be correspondingly adapted.

[0048]

More extensive application examples aim at all areas in which in a liquid environment, a defined quantity of a special active substance must be metered in. This can extend from a simple metering of an active substance against algae growth in an aquarium to disinfection and cleaning baths in medicine, and on to process baths in industry. Depending on the individual usage purpose, the sensors and the sensor system must be correspondingly adapted, but the basic principle of an independent metering, as needed, is retained in all cases, however.

Claims

1. Metering system (1) for holding a washing substance (3) in the washing space, in particular, the washing drum, of a washing machine, with at least one holding space (2), and at least one correlated outlet (4) for the release of the at least one washing substance (3) during the washing process, characterized in that the metering system (1) has at least one control element (5), so that the release of the washing substance (3) during the washing process can be controlled and/or that the metering system (1) has available washing substances (3) for several washing processes and, per washing process, releases a certain quantity.

2. Metering system according to Claim 1, characterized in that the release of several washing substances (3) can be controlled, in particular, independently of one another.

3. Metering system according to Claim 1 or 2, characterized in that the control element (5) is correlated with the holding space (2), the outlet (4) and/or a conduit (6) connecting the holding space (2) with the outlet (4), in particular, wherein the outlet (4) and/or the conduit (6) is blocked off, as needed, by means of the control element (5).

4. Metering system according to one of the preceding claims, characterized in that the release of the washing substance (3) can be controlled as a function of at least one parameter, in particular, as a function of the quantity of water, the water filling and/or wetting, the water entry and/or the water exit, the time period and/or the time, in particular, with reference to the washing process, temperature, pH value, water hardness and/or ion and/or substance concentration.

5. The metering system according to one of the preceding claims, characterized in that the release of the washing substance (3) can be interrupted in a controlled manner.

6. Metering system according to one of the preceding claims, characterized in that the metering system (1) has a control device (7), in particular, wherein the control device (7) works electrically, has a microprocessor, is formed by a microprocessor, and/or controls the control element (5).

7. Metering system (1) according to Claim 6, characterized in that the control element (5) can be controlled electrically by the control device (7) and preferably is connected to the control device (7), via at least one electrical connection conduit (8), and/or is integrated into it.

8. Metering system (1) according to Claim 6 or 7, characterized in that the control device (7) has a time basis, and/or that the control device (7) has a basis for the detection of a temperature gradient, in particular, a rise in temperature.

9. Metering system (1) according to one of Claims 6-8, characterized in that control functions of the control device (7) can be programmed, in particular, can be carried out by a control program.

10. Metering system (1) according to one of Claims 6-9, characterized in that the control element (5) comprises a pump, a valve, an adjustable throttle, or another conveyance device.

11. Metering system (1) according to one of the preceding claims, characterized in that the metering system (1) has at least one sensor (9) for the recording of at least one parameter.

12. Metering system (1) according to Claim 11, characterized in that the sensor (9) records the quantity of water, the water filling and/or wetting, the water entry and or exit, the time period and/or the time, in particular, relative to the washing process, the temperature, the pH value, the water hardness, and/or the ion and/or substance concentration and/or their changes.

13. Metering system (1) according to Claim 11 or 12, characterized in that by means of the sensor (9), at least one switching function can be triggered, in particular, the switching on and/or the switching off of the metering system (1) and/or the selection of a control program.

14. Metering system (1) according to the previous claims, characterized in that the metering system (1) has an energy supply device (10), in particular a voltage source.

15. Metering system (1) according to Claim 14, characterized in that the energy supply device (10) is used for the electrical supply of a control device (7), a sensor (9) and/or the control element (5).

16. Metering system (1) according to Claim 14 or 15, characterized in that the energy supply device (10) has a battery or a storage cell.

17. Metering system (1) according to one of the preceding claims, characterized in that the metering system (1) has an indicator device (11).

18. Metering system (1) according to Claim 17, characterized in that the indicator device (11) has a digital indicator and/or a light-emitting diode.

19. Metering system (1) according to Claim 17 or 18, characterized in that the indicator device (11) has a function and/or state indication and/or a load indication.

20. Metering system (1) according to one of the preceding claims, characterized in that the metering system (1) has an input or operating element.

21. Metering system (1) according to Claim 20, characterized in that the input or operating element makes possible a switching on and/or switching off of the metering system (1) and/or the selection of a control program.

22. Metering system (1) according to one of the preceding claims, characterized in that the metering system (1) makes possible a data exchange with the washing machine, so that in particular, the metering system (1) can be controlled via input or operating elements of the washing machine control.

23. Metering system (1) according to one of the preceding claims, characterized in that the metering system (1) has an especially water-tight housing (12), which is preferably formed in the shape of a sphere or ellipsoid and/or is at least partially transparent.

24. Metering system (1) according to Claim 23, characterized in that the housing (12) is elastic and/or can be compressed.

25. Metering system (1) according to Claim 23 or 24, characterized in that the housing (12) is constructed so that it can be opened, in particular, can be unscrewed or unlocked.

26. Metering system (1) according to one of the preceding claims, characterized in that the metering system (1) has at least one filling and/or venting opening.

27. Metering system (1) according to one of the preceding claims, characterized in that the holding space (2) or several holding spaces (2) is or are formed by a tank, which, in particular, can be removed and/or exchanged and/or refilled.

28. Method for the washing of clothes in a washing machine, wherein at least one washing substance (3) is released into the washing space, in particular, the washing drum, of the washing machine, during the washing process by a metering system (1) found in the washing space, characterized in that the release of the washing substance (3) into the washing space takes place in a controlled manner.

29. Method according to Claim 28, characterized in that the release of the washing substance (3) is controlled as a function of at least one parameter of the washing process.

30. Method according to Claim 28 or 29, characterized in that the release of the washing substance (3) is controlled as a function of the quantity of water, the water filling and/or wetting, the water entry and/or exit, the time period and/or the time, in particular, with reference to the washing process, the temperature, the pH value, the water hardness and/or the ion and/or substance concentration.

31. Method according to one of Claims 28-30, characterized in that a parameter is recorded by means of a sensor (9).

32. Method according to Claim 31, characterized in that by means of the sensor (9), the release of the washing substance (3) into the washing space is triggered directly or indirectly.

